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ABSTRACT

One of 15 core modules in a 22-module series designed to train vocational education curriculum specialists (VECS), this guide is intended for use by both instructor and student in a variety of education environments, including independent study, team teaching, seminars, and workshops, as well as in more conventional classroom settings. The guide has five major sections. Part I, Organization and Administration, contains an overview and rationale, educational goals and performance objectives, recommended learning materials, and suggested reference materials. Part II, Content and Study Activities, contains the content outline arranged by goals. Study activities for each goal and its corresponding objectives follow each section of the content outline. Content focus is on how knowledge of learning concepts can be applied in the planning of vocational instruction, what steps take place in an act of learning and why each step is important, and the importance of learning outcomes (verbal information, intellectual skills, cognitive strategies, attitudes and motor skills). Part III, Group and Classroom Activities, suggests classroom or group activities and discussions keyed to specific content in the outline and to specific materials in the list of references. Part IV, Student Self-Check, contains questions directly related to the goals and objectives of the module, which may be used as a pretest or posttest. Part V, Appendix, contains suggested responses to the study activities from part II and responses to the student self-checks. (HD)

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VOCATIONAL EDUCATION CURRICULUM SPECIALIST

VECS

Module 2:

Learning Processes and Outcomes

STUDY GUIDE

(TEACHING/LEARNING MODULE)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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-Study Guide-

Module 2

LEARNING PROCESSES AND OUTCOMES

This document is one of a series of teaching/learning modules designed to train Vocational Education Curriculum Specialists. The titles of all individually available documents in this series appear below:

INTRODUCTORY MODULES

1. The Scope of Vocational Education
2. Roles of Vocational Educators in Curriculum Management
3. Current Trends in Vocational Education
4. Organization of Vocational Education
5. Legislative Mandates for Vocational Education
6. The Preparation of Vocational Educators

CORE MODULES

1. Important Differences Among Learners
2. Learning Processes and Outcomes
3. Applying Knowledge of Learning Processes and Outcomes to Instruction
4. Assessing Manpower Needs and Supply in Vocational Education
5. Laying the Groundwork for Vocational Education Curriculum Design
6. Selecting Instructional Strategies for Vocational Education
7. Derivation and Specification of Instructional Objectives
8. Development of Instructional Materials
9. Testing Instructional Objectives
10. Fiscal Management of Vocational Education Programs
11. Introducing and Maintaining Innovation
12. Managing Vocational Education Programs
13. Basic Concepts in Educational Evaluation
14. General Methods and Techniques of Educational Evaluation
15. Procedures for Conducting Evaluations of Vocational Education

SEMINARS AND FIELD EXPERIENCE MODULE

(Seminars in Authority Roles and the Curriculum Specialist in Vocational Education, and Leadership Styles and Functions of the Curriculum Specialist in Vocational Education; field work in Project Design and Administration, Operation of School Programs, Evaluation of School Programs, Educational Research and Development, and State, Regional, and Federal Program Supervision)

INSTALLATION GUIDE

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PREFACE

Who is a vocational education curriculum specialist? The answer to this question is not as simple as it might appear. A vocational education curriculum specialist is likely to work in many different capacities, including, but not limited to: instructor, department chairperson, dean of vocational-technical education, vocational supervisor, principal, state or local director of vocational education, and curriculum coordinator.

The specialist is, perhaps, more identifiable by his/her responsibilities, which include, but are not limited to:

- planning, organizing, actualizing, and controlling the work of an educational team performed to determine and achieve objectives.
- planning, organizing, and evaluating content and learning processes into sequential activities that facilitate the achievement of objectives.
- diagnosing present and projected training needs of business, industry, educational institutions, and the learner.
- knowing, comparing, and analyzing different theories of curriculum development, management, and evaluation and adapting them for use in vocational-technical education.

This teaching/learning module is part of a set of materials representing a comprehensive curriculum development project dealing with the training of vocational education curriculum specialists. The purpose of this two-year project was 1) to design, develop, and evaluate an advanced-level training program, with necessary instructional materials based on identified vocational education curriculum specialist competencies, and 2) to create an installation guide to assist instructors and administrators in the implementation process.

The curriculum presented here is, above all else, designed for flexible installation. These materials are not meant to be used only in the manner of an ordinary textbook. The materials can be used effectively by both instructor and student in a variety of educational environments, including independent study, team teaching, seminars, and workshops, as well as in more conventional classroom settings.

Dr. James A. Dunn
Principal Investigator and
presently Director,
Developmental Systems Group
American Institutes for Research

ACKNOWLEDGEMENTS

The Vocational Education Curriculum Specialist Project was a comprehensive development and evaluation effort involving the contribution of a large number of people: project staff, curriculum consultants, a national advisory panel, and a number of cooperating colleges and universities. This wide variety of valuable inputs makes it difficult to accurately credit ideas, techniques, suggestions, and contributions to their originators.

The members of the National Advisory Panel, listed below, were most helpful in their advice, suggestions, and criticisms.

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Mary Ellis	*President, American Vocational Association*
George McCabe	*Program Director, Consortium of California State University and Colleges*
Curtis Henson	*Atlanta Independent School District, Georgia*
Ben Hirst	*Director, Consortium of the States, Atlanta, Georgia*
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Rita Richey	*Wayne State University*
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William Stevenson	*Oklahoma State Department of Education*

The project would not have been possible without the cooperation and commitment of the field test institutions listed below.

California State University, Long Beach
California Polytechnic State University, San Luis Obispo
Consortium of California State University and Colleges
- California State University, Sacramento
- California State University, San Diego
- California State University, San Francisco
- California State University, San Jose
- California State University, Los Angeles

Iowa State University
University of California Los Angeles
University of Northern Colorado

Overall responsibility for the direction and quality of the project rested with James A. Dunn, Principal Investigator. Project management, supervision, and coordination were under the direction of John E. Bowers, Project Director.

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Part I:

Organization and Administration

PART I
ORGANIZATION AND ADMINISTRATION

Guidelines

This study guide has five major sections. Each section contains useful information, suggestions, and/or activities that assist in the achievement of the competencies of a Vocational Education Curriculum Specialist. Each major section is briefly described below.

PART I: ORGANIZATION AND ADMINISTRATION

PART I contains an Overview and Rationale, Educational Goals and Performance Objectives, Recommended Learning Materials, and Suggested Reference Materials. This section will help the user answer the following questions:

- How is the module organized?
- What is the educational purpose of the module?
- What specifically should the user learn from this module?
- What are the specific competencies emphasized in this module?
- What learning materials are necessary?
- What related reference materials would be helpful?

PART II: CONTENT AND STUDY ACTIVITIES

Part II contains the content outline arranged by goals. The outline is a synthesis of information from many sources related to the major topics (goals and objectives) of the module. Study activities for each goal and its corresponding objectives follow each section of the content outline, allowing students to complete the exercises related to Goal 1 before going on to Goal 2.

PART III: GROUP AND CLASSROOM ACTIVITIES

The "Activities-Resources" column in the content outline contains references to classroom or group activities and discussion questions related to specific content in the outline. These activities and discussion questions

are located in PART III and are for optional use of either the instructor or the student. Both the classroom activities and discussion questions are accompanied by suggested responses for use as helpful examples only--they do not represent conclusive answers to the problems and issues addressed. Also contained in the "Activities-Resources" column are the reference numbers of the resources used to develop the content outline. These reference numbers correspond to the numbers of the Suggested Reference Materials in PART I.

PART IV: STUDENT SELF-CHECK

PART IV contains questions directly related to the goals and objectives of the module. The self-check may be used as a pre-test or as a post-test, or as a periodic self-check for students in determining their own progress throughout the module.

PART V: APPENDICES

Appendix A contains responses to the Study Activities from PART II, and Appendix B contains responses to the Student Self-Check. The responses provide immediate feedback to the user and allow the module to be used more effectively for individualized study. They have been included in the last part of the module as appendices to facilitate their removal should the user wish to use them at a later time rather than concurrently with the rest of the module.

Approximately 30 hours of out-of-class study will be necessary to complete this module.

Overview and Rationale

The learning psychologist attempts to discover principles that explain how people learn. His science, like all sciences, has both an esoteric, theoretical side and a practical side. It is the practical side that is the concern of this module.

The references for the module emphasize how principles discovered by learning psychologists can be used to assess the steps that take place during an act of learning and the outcomes that result from learning. The exercises emphasize the application of these learning principles to vocational education. Some of the classroom activities illustrate the more theoretical or academic aspects of the subject. These activities are clearly labeled.

The module is divided into three major content areas. The first explains the usefulness of applying learning concepts when planning vocational instruction.

The second content area describes the steps involved in an act of learning and emphasizes the importance of each step to vocational education. It also gives special attention to motivation.

The final content area discusses the types of capabilities that result from learning and the importance of each type in vocational education.

Goals and Objectives

Upon completion of this module, the student will be able to achieve the following goals and objectives:

GOAL 2.1: UNDERSTAND HOW KNOWLEDGE OF LEARNING CONCEPTS CAN BE APPLIED IN THE PLANNING OF VOCATIONAL INSTRUCTION.

Objective 2.11 Develop a rationale for why the vocational curriculum specialist needs an understanding of learning principles.

Objective 2.12 Define "learning" and explain why learning is the primary goal of instruction.

Objective 2.13 Explain how learning concepts can help the vocational teacher provide more effective instruction.

Objective 2.14 Explain how knowledge of learning concepts can facilitate curriculum design and development.

GOAL 2.2: KNOW WHAT STEPS TAKE PLACE IN AN ACT OF LEARNING AND WHY EACH STEP IS IMPORTANT IN VOCATIONAL INSTRUCTION.

Objective 2.21 List the phases in an act of learning.

Objective 2.22 Specify the process associated with each phase.

Objective 2.23 Show, with examples, how each step is included in learning knowledge, skills, and attitudes in a vocational course.

Objective 2.24 Specify the motivational functions of the vocational instructor and indicate how various features of the learning situation can affect motivation.

GOAL 2.3: DESCRIBE THE IMPORTANCE OF EACH OF THE FOLLOWING CATEGORIES OF LEARNING OUTCOMES IN VOCATIONAL EDUCATION: VERBAL INFORMATION, INTELLECTUAL SKILLS, COGNITIVE STRATEGIES, ATTITUDES, AND MOTOR SKILLS.

Objective 2.31 Define each of these capabilities with regard to learning.

Objective 2.32 Demonstrate how vocational instruction enhances each of these capabilities.

Objective 2.33 Identify behavior patterns that are evidence of the development of each of the capabilities.

Recommended Materials

1. Gagné, Robert M. Essentials of Learning for Instruction. Hinsdale, Illinois: The Dryden Press, 1974.

2. Erickson, Lawrence W.: "Motivation for Learning in Vocational Education." In The Individual and His Education, edited by Alfred H. Krebs. Second Yearbook of the American Vocational Association. Washington, D.C.: AVA, 1972.

Suggested References

1. American Vocational Association. The Role of Postsecondary Occupational Education. Washington, D.C.: American Vocational Association, 1972.

2. Coopersmith, S. Frontiers of Psychological Research. San Francisco, California: W. H. Freeman, 1966.

3. Erickson, L. W. "Motivation for Learning in Vocational Education." In The Individual and His Education, edited by A. H. Krebs. Washington, D.C.: The American Vocational Association, 1972.

4. Frykland, V. L. Analysis Technique for Instruction. Milwaukee, Wisconsin: The Bruce Publishing Company, 1965.

5. Gagné, R. M. Essentials of Learning for Instruction. Hinsdale, Illinois: The Dryden Press, 1974.

6. Gagné, R. M., and Briggs, L. J. Principles of Instructional Design. New York: Holt, Rinehart and Winston, Inc., 1974.

7. Leighbody, G. B., and Kidd, D. M. Methods of Teaching Shop and Technical Subjects. Albany, New York: Delmar Publishers, Inc., 1966.

8. Mager, R. F. Developing Attitude Toward Learning. Belmont, California: Fearon Publishers, 1968.

9. Mager, R. F., and Pipe, P. Analyzing Performance Problems or 'You Really Oughta Wanna.' Belmont, California: Fearon Publishers, 1970.

10. Polya, G. How to Solve It. Garden City, New York: Doubleday and Company, 1971.

11. Skinner, B. F. "How to Teach Animals." Scientific American 185 (1951): 26-29.

12. Skinner, B. F. The Technology of Teaching. New York: Appleton-Century-Crofts, 1968.

13. Till, R. E., and Jenkins, J. J. "The Effects of Cued Orienting Tasks on Free Recall of Words." Journal of Verbal Learning and Verbal Behavior 12 (1973): 489-498.

NOTE: The reading materials required for use with this module contain a wealth of up-to-date resources for further reading and study. The "General References" suggested at the end of each of Gagné's chapters are particularly good resources for psychology and education. Erickson, in his more specialized domain, also provides an excellent list of references.

Part II:

Content and Study Activities

PART II
CONTENT AND STUDY ACTIVITIES

Goal 2.1

Content Outline	Activities-Resources
Goal 2.1: Understand How Knowledge of Learning Concepts Can Be Applied in the Planning of Vocational Instruction.	
A. Why Study Learning Principles? (5)	(5) Essentials of Learning for Instruction, Chap. 1, pp. 2-4, 19-22.
1. Each person should develop his own rationale for studying learning principles. For vocational education, this rationale will be built, in general, around job-related concerns. To develop such a rationale, one should first ask why an understanding of learning principles is useful to any field, and then ask what particular tasks and duties a vocational education curriculum specialist (VECS) might perform that would be made easier by an understanding of learning principles.*	* See Discussion Question A in Part III.
2. Students should be encouraged to continue developing their rationale as the module proceeds. In doing so, they should consider:	
a. the tasks that a VECS might perform;	
b. the learning problems that the VECS might encounter;	
c. the tasks and problems that seem to call for a knowledge of learning principles;	

d. the questions that should be asked about learning principles when completing each task; and

e. the limitations there are on the use of learning principles.

B. Definitions of Learning (5)

(5) Essentials of Learning for Instruction, Chap. 1, pp. 5-7.

Psychologists define learning in many different ways, depending, to a large degree, on their theoretical orientation.

1. Most agree that an adequate definition of learning includes the points mentioned in the following: Learning is a process of behavior modification that can be observed, that persists over periods of time, and that is brought about through interaction with the external environment.
2. Disagreement tends to arise over whether or not internal processes should be included in the definition, and if so, how best to describe them.

C. Learning Concepts as Tools in Teaching and Curriculum Design* (5)

* See Discussion Questions B and C in Part III.

(5) Essentials of Learning for Instruction, Chap. 1, pp. 19-22.

1. The teacher often serves as:
   a. a designer of the learning environment;
   b. a manager of learning experiences;
   c. a diagnostician of learning problems;
   d. an evaluator of learning;
   e. additionally, teachers often perform functions not directly related to instructions, such as program planning, maintenance of discipline, or administrative functions. These activities, while not

directly involving instruction, facilitate learning by shaping the environment.*

2. The vocational curriculum developer must address the same concerns as the teacher, but his emphasis is different. The teacher is concerned with teaching particular students in a particular lab or classroom. The curriculum developer is concerned with developing materials and evaluation instruments that are readily usable in a broad range of contexts.

* See Discussion Questions D and E in Part III.

D. Study Activities

Based on your reading of the content outline and any additional references as suggested, complete the following activities.

Rationale for Studying Learning Principles

The rationale for studying anything is that it will have some useful result. The activities below are designed to help you see for yourself the usefulness of learning principles to the vocational curriculum specialist. In completing the following questions, you will find it very useful to ask yourself:

What problems have I faced in dealing with students, parents, administrators, and others in designing, defending, or implementing instruction?

What questions would I want to ask a "curriculum specialist" if I were a businessman, teacher, labor leader, etc.?

What help would I expect from a curriculum specialist if I were a teacher, counselor, etc.?

1. Consider the following tasks that a vocational educator might perform:

   Task 1. Help motivate an unambitious student.
   Task 2. Explain a new instructional approach to the board of education.
   Task 3. Help teachers to individualize instruction.
   Task 4. Lobby for increased funding from the state.
   Task 5. Develop guidelines for teaching a new vocational subject for use throughout a district or state.

   Knowledge of learning principles will be helpful in completing each task. For some tasks, they will be of major importance, for others of relatively little importance. In a line or two, describe how completion of each task might be facilitated by a knowledge of learning principles. Keep your answers simple. A sample answer is given for Task 2.

Task 1:

Task 2: Knowledge of learning principles will help the curriculum specialist explain why the new approach is superior to the approach previously used, what can be accomplished with this new approach, how it will help overcome an educational problem, etc.

Task 3:

Task 4:

Task 5:

2. The table below lists several types of people with whom the vocational curriculum specialist may have to interact from time to time. For each type of person, list one or two ways in which knowledge of learning principles might facilitate the interaction. A sample answer is given for the first type.

Type of Person	Usefulness of Understanding Learning Principles when Interacting with this Type of Person
Business	Explain why on-the-job training will result in a worker who is able to become productive more quickly when hired.
Union president	
School board member	

Type of Person	Usefulness of Understanding Learning Principles when Interacting with this Type of Person
Parent of student	
Educational psychologist	
Academic teacher	
Counselor	
Student	

3. Provide a definition of learning.

4. List two or three things that you want students to learn in a class. For each of these, indicate:

   a. the instructional strategies (teaching methods, teaching aids, materials, etc.) that you use in instruction;

   b. the behavior that you hope to see; and

   c. the way in which you determine if the behavior change is persistent.

   A sample response for a home economics class might be:

Thing to be learned:	To properly thread a sewing machine
Instructional strategies:	Demonstration by instructor; chart showing proper path of thread and explanation of steps to be performed in threading; a properly threaded machine for students to inspect
Desired behavior:	Properly thread machine, without assistance, in a reasonable time
Check for persistence:	Examination after appropriate period; ability of student to change bobbin, as necessary, in completing class exercises

5. Why should all aspects of the instructional environment be directed toward supporting learning by the student?

6. In Activity 4, you listed some things that you want students to learn. Explain in a paragraph or two why it is important for the student to learn each of these things.

   For the sample response provided for Activity 4, possible reasons are:

   a. the student, sewing at home, must be able to thread a machine; he will have no one to call on for help;
   b. the student, sewing on the job, will get on poorly with supervisors if he requires frequent assistance with threading, a task he should be able to perform for himself.

7. In Activity 4, you listed several "instructional strategies." Describe in a sentence or two how each of these methods, aids, etc., supports the desired learning.

   For example, in the case of the home economics class, the threading chart might be useful as it can be examined by the student as needed, and, since it includes directions, it can help the student overcome problems on his own without running to the instructor for assistance.

8. List five tasks that a vocational teacher must perform in <u>each</u> of the following capacities:

   a. as a designer of learning;
   b. as a manager of learning;
   c. as an evaluator of learning.

   In a sentence or two, describe a problem that may be encountered in completing each task. Briefly explain how an understanding of learning principles might help the teacher overcome each problem.

   A sample task for each capacity is listed below, together with a problem and a way in which knowledge of learning principles might help solve it.

a. Designer of Instruction

Task:	Determine sequence of topics.
Problem:	Scheduling of lab and classroom periods makes it difficult to coordinate practice and theory portions of the subject matter.
Use of Learning Principles:	Determine which concepts and principles are needed before lab exercises can be undertaken, and give them priority.

b. Manager of Instruction

Task:	Present an abstract concept needed for a lab exercise.
Problem:	Some students do not understand the concept.
Use of Learning Principles:	Determine why each student is having trouble and develop an appropriate way to help that student.

c. Evaluator of Learning

Task:	Develop a test to see if a student can apply theoretical knowledge to practical situations.
Problem:	Some applications are harder than others; how can an appropriate test be selected?
Use of Learning Principles:	Often, a difficult application requires the student to know a lot more than just the appropriate principle. Assess the task to see what other skills or knowledge (if any) are presupposed by the problem.

9. A vocational education curriculum specialist (VECS) could find employment in a variety of settings. A VECS might work in curriculum development at the state level or the district level, or work as an in-house specialist at a vocational center, and so on.

   In each setting, the VECS may be involved in designing instruction, developing the curriculum, or developing the instructional materials.

Similarly, he may have some involvement in helping to assess learning, or in planning for its assessment, or in helping others to manage instruction more effectively.

Describe in a line or two a specific job that a VECS might do. List several tasks related to planning instruction, to delivering instruction, and to evaluating learning that the VECS might perform in that job. Briefly explain how a knowledge of learning principles might help the VECS perform each task.

A sample response might be:

VECS Job: Materials Developer in the State Department of Vocational Education.

Tasks: Designing Instruction - sequencing units; developing pamphlets, film loops, charts, and other materials for use in instruction, etc.
Managing Instruction - providing a guide for the instructor, describing how to use the materials effectively; conducting workshops, etc.
Evaluating Learning - providing examination materials; providing suggestions for developing performance tests; suggesting performance standards, etc.

Use of Learning Principles:
Many of the tasks, such as sequencing units of instruction, are similar to the tasks provided as a sample for Activity 8. Other tasks present different problems. For example: In suggesting performance standards, the VECS must develop standards that are flexible enough to be applied in a variety of schools, with different facilities and equipment, across the state. Learning principles can help him isolate the important factors that an adequate assessment procedure must use in developing such standards.

(See Appendix A for possible answers.)

Goal 2.2

Content Outline	Activities-Resources

Goal 2.2: Know What Steps Take Place in an Act of Learning and Why Each Step is Important in Vocational Instruction.

A. Learning Phases and Processes (5) — (5) Essentials of Learning for Instruction, Chap. 2.

1. Gagné identifies eight phases in an act of learning and specifies the process(es) associated with each. Sequentially, these are:

Phase	Process(es)
Motivation	Expectancy
Apprehending	Attention; selective perception
Acquisition	Coding; storage entry
Retention	Memory storage
Recall	Retrieval
Generalization	Transfer
Performance	Responding
Feedback	Reinforcement

A phase, together with its associated process(es), is what we mean by a step.

2. Such steps occur in all acts of learning and provision must, therefore, be made for them in the lesson.
   a. Sometimes the steps are so easy that they are hardly noticed.
   b. Sometimes the steps are very difficult to take and special techniques, demonstrations, etc. may be required for their sucessful achievement.

c. Although similar processes occur in all acts of learning, the same technique is not necessarily called for in all situations and that same technique will not necessarily work for all students in a given situation.

3. Reasons for studying the steps include:

a. The teacher or curriculum developer can plan learning activities more effectively once he understands what goes on in an act of learning.

b. The teacher or consultant will be better able to troubleshoot and to remedy educational problems if he can detect the point at which the problem occurred.*

* See Discussion Question F in Part III.

B. Steps in an Act of Learning and Vocational Education

In this section, each step will be briefly described and examples provided showing instances where the step is easy or difficult to take.

1. Motivation

a. (Motivation is discussed again in more detail in Section C for this goal, "Motivation in Vocational Education." You may use the expanded treatment now or after all phases of the learning act have been introduced, whichever is most appropriate.)

b. Establishing motivation (expectancy of reinforcement) is a necessary prerequisite for learning. This means that:

(1) the reinforcement offered to the student must be effective for that student;

(2) the student must believe that he can <u>really</u> obtain the reinforcement, that is, the accomplishments upon which the reinforcement is contingent must appear possible to the student.

c. Step easy: An auto shop student wishes to rebuild the engine of his own car; the section on engine overhaul is about to begin.

d. Step difficult: An auto shop student is forced to take the course by his father; the student regards himself as intellectual and sees mechanical work as beneath his dignity.

2. <u>Apprehending</u>

a. Once the student is motivated to learn, he must next apprehend the instruction presented. This includes not only <u>attending</u> to the instruction but also <u>perceiving</u> the appropriate features.

b. The person new to a situation will often pay attention to irrelevant aspects of that situation and miss many important ones.

c. Step easy: An instructor shows a student the location of the lever to pull to release the catch on the cover of the typewriter carriage.

d. Step difficult: An instructor wishes to show a student the sequence of operation of the <u>typing head mechanism</u> after a key is struck.

Problems: the mechanism is small, out of sight, and moves very quickly.

3. Acquisition
   a. During this phase, the student codes information for storage in his memory. This information may concern skilled acts as well as verbal knowledge.
   b. The crucial thing to notice is that the information is coded before it is stored, that is, what the student stores is not the same as what was presented. The trick is to be sure that the student properly codes the relevant material.
   c. Background for examples of easy step and difficult step: A teacher wishes students to deal with complaints by customers. He sets up roleplaying situations to illustrate the use of principles.
      (1) Step easy: A teacher of ornamental horticulture wants his students to learn the techniques for making a small garden seem large. The teacher states the techniques (such as the frequent inclusion of small rises and paths on different levels, as in a Japanese garden) and shows photographs exemplifying the use of these techniques. He points out how the techniques are used as he shows each photograph. This way of presenting the material helps to make the proper coding for memory storage clear to the students.

(2) Step difficult: A second leader simply presents the photographs without explaining how they illustrate the application of landscaping techniques. Thus, the students have to figure out the proper way to code the information for themselves.

4. Retention

Once information is coded and entered into storage, it is retained for later recall. As Gagné points out, the characteristics of this phase are very difficult to determine. The main problem is that in order to find out if something has been retained, we must get the student to recall it. If the student does not recall something, however, the failure may be due to one of two things: either it was not retained or there was an inadequate attempt to recall it.

5. Recall*

a. In this phase, the student searches through memory storage for the information needed to deal with whatever situation is at hand.

b. In searching for this information, the student will rely on retrieval cues. These cues may be provided by either the student or the environment. Initially, cues will have to be supplied by the teacher. As the student gains sophistication, however, he can become independent of the instructor and select appropriate external cues on his own.

c. What the student is supposed to recall will depend on the goal of the instruction. Facts,

* Student should complete Classroom Activity 1 which relates to Objective 2.23. See Part III.

methods of finding facts, and general rules that can be applied in particular situations are among the things a student may be asked to recall.

d. Step easy: A student has been provided with a number of cues to help him recall whether it is acid that should be added to water, or water to acid. These included posters, explanations and films showing the proper procedure. If he can remember any of them, he will perform appropriately.

e. Step difficult: A student has learned isolated rules for combining acid and water; he has no cues, however, to help him recall whether the rule was "add acid to water" or "add water to acid."

6. Generalization

a. Rarely does one wish to train a student to deal with only a single situation. We want students to be able to sell a variety of products, to set the timing correctly on many different engines, and to raise diverse crops. That is, we want them to transfer their knowledge to situations that differ from those in which they were trained but to which their knowledge is applicable.

b. The process of generalization is called transfer. When the use of information in a new situation facilitates performance, it is called positive transfer; when it hampers performance in a new situation, it is called negative transfer.

c. Step easy: An agriculture teacher has explained the principles of matching fertilizers to soil conditions, and has given students practice in applying these principles. The student knows how to apply knowledge to a new situation.

d. Step difficult: An agriculture teacher has taught procedures for a few common soil types. The student is baffled by a soil type different from those previously encountered.

7. Performance

a. Only through student performance can the teacher determine whether or not learning has taken place. "Can the student do what the instruction was supposed to teach him to do?"--that is the important question. The only way to find out is to ask the student to perform tasks that require use of the knowledge, concept, or skill.

b. Step easy: An instructor describes a technical drawing task in the same terms as those used during instruction. The student can easily organize his response.

c. Step difficult: An instructor requires a conversion of scales from English to metric as part of a technical drawing task. The student must make considerable calculations before organizing his performance.

8. Feedback*

a. Based on the performance of the student, the teacher can formulate feedback for the

* Students should complete Classroom Activity 2 which relates to Objective 2.23. See Part III.

student. This feedback will inform the student of the quality of his performance and suggest ways to make necessary improvements.

b. Step easy: A student who is eager to learn accepts criticism well. The instructor need only suggest that changes in batter will eliminate the "doughy" taste of the pancakes and the student makes them.

c. Step difficult: A student does not like the course and is moody and unstable; to suggest even in a gentle tone that his pancakes are "doughy" may cause a tantrum or moping.*

* See Discussion Question G in Part III.

C. Motivation in Vocational Education (3)

The importance of understanding both the role of motivation in learning and the way in which the learning environment can be arranged to enhance motivation makes this a topic of great interest to vocational educators since educational goals often have a delivery time several years distant. For example, a 16-year-old welding student will probably be from three to five years away from gainful employment. This built-in delay in payoff for training in specific occupations challenges the vocational teacher to devise motivational strategies that maintain interest.

1. This portion of the module is based on "Motivation for Learning in Vocational Education" by L. W. Erickson.

(3) "Motivation for Learning in Vocational Education.

Erickson discusses both the motivational functions of the teacher, and learning conditions that affect motivation.*

2. Erickson identifies four motivational functions of the teacher:
   a. Arousal Function. Arousal has two aspects: (1) the stimulation and maintenance of interest that is necessary for attention and response to instruction; (2) overstimulation and stress that results in flustering and failure, particularly at examination time.
   b. Expectancy Function. Involves clarifying for the student the end result of instruction. This may include more than simply telling students the intended end result. Some students may not want to expend the effort needed to reach that objective; others may not be convinced that they really can reach the objective, no matter how attractive. Establishing expectancy often requires a great deal of skill on the part of the teacher.
   c. Incentive Function. The incentive is the reward the student expects as a result of his efforts. The expectancy function told the learner what he would be able to do at the end of learning; the incentive function tells the learner what benefit he will derive. If the student values the skill that he expects to learn, then the expectancy, in and of itself, is incentive enough. If the student does

* See Discussion Question H in Part III.

not value what he expects to be able to do at the end of instruction, then other incentives must be provided. A skilled teacher will use other incentives as supports for learning while trying to get the student to value the skill that will ultimately be taught.

d. Direction-of-Learning Function. This function involves weaning the student from dependency on the teacher. To achieve this end, the teacher must convince the student that such increased autonomy will more adequately meet his needs.

3. Learning Conditions that Affect Motivation
Erickson identifies many conditions that can affect learner motivation. In planning and delivering instruction, the vocational instructor needs to be aware of the importance of these conditions. The VECS should be prepared to help identify these conditions and to assist the instructor in using them to further his instructional goals. These conditions are summarized below:

a. Active Learner Participation. This condition is based on the principle that learning is something one must do for himself. Another person can establish conditions to facilitate learning, but only the learner who is actively participating can hope to accomplish anything.

b. The Learning Task and Task Set. This

condition suggests that the purpose of the course (or section of the course) be made as clear as possible to the student. The goals can be given by verbal explanation or demonstration.

c. Simple-to-Complex Learning Progression. In such an arrangement, the tasks which the student can master most easily are placed first and followed by more difficult ones. By this arrangement, the student encounters more frequent successes while making progress toward the eventual goal.

d. Reinforcement. Reinforcement and feedback were discussed above, but one particularly powerful technique not mentioned before, but touched upon briefly in the last paragraph of Erickson's discussion, is "shaping." In "shaping" a response, one gives reinforcement for responses that come increasingly close to the goal. In this way, the student is encouraged to work toward the goal while improving his technique. This is a particularly useful method for teaching complex motor responses such as those required in many vocational fields. The instructor can give reinforcement for the first attempt (no matter how poor) and insist on increasingly improved performance before reinforcement is given again.

e. Transfer. As discussed earlier, transfer occurs when the process of learning to perform a task is affected by previous learning. The teacher attempts to encourage positive transfer, wherein performing a task is made easier by virtue of previous learning. Possibilities for transfer should be pointed out to students from time to time. Not only will students be more likely to persist at a task if they can see its usefulness for what follows, but they will be more likely to transfer successfully if alerted to the possible applications of the new knowledge.

f. Evaluation. Evaluation should be undertaken with learning in mind. If a student fails to perform adequately, the evaluation can be given to the student in a way that offers concrete suggestions for improvement. It can also be used to suggest areas where the course itself needs to be improved, that is, areas in which students consistently fail.

g. Motivational Variables in the Classroom. The conditions discussed above should all be considered in planning course content, in sequencing the content, in determining what instructional methods are to be used and in evaluating student progress. In addition, the instructor should be alert to important, analagous variables in the day-to-day conduct of

his courses. These variables, as discussed by Erickson include:

(1) the difficulty of the task facing the student,

(2) the tensions or anxiety that the student is feeling,

(3) the degree of interest the student feels in the skill or knowledge being learned in a lesson,

(5) the degree of healthy competition, and

(6) the way in which the student is kept aware of his progress (12).*

(12) The Technology of Teaching discusses the Skinnerian view of motivation and its role in the total instructional setting. Moreover, the programmed instruction movement, of which Skinner was a leader, is thought by many to have given impetus to criterion referenced measurement (see Module 9). The serious student will find that this book provides valuable background information.

* See Discussion Questions I and J in Part III.

D. Study Activities

Based on your reading of the content outline and any additional references as suggested, complete the following activities.

1. List in order the phases of an act of learning as specified by Gagné.

2. The learning processes identified by Gagné are listed below. Write the name of the phase associated with each process.

Process
reinforcement
retrieval
memory storage
attention; selective perception
responding
coding; storage entry
expectancy
transfer

3. Give an example from your own field of expertise showing how each learning step is involved in learning a fact, a concept, or a rule.

4. Give two more examples, one showing how each step is involved in learning a motor skill, and a second showing how each step is involved in developing an appropriate attitude.

The following is a sample response:

Attitude: Safety conscious while operating power saws. (For instructional purposes, this attitude, in effect, means that the teacher wants the student to operate power saws in a safe manner.)

Steps:

Motivation: The student must be at least willing to learn safe operation; it would be better if the student were eager to learn it.

Apprehending:	The important stimuli relating to safe or unsafe operation must be brought to the student's attention. These will include: placement of the guard; hand position on the wood, guard, and guide; the "feel" associated with wood being pushed at various speeds, and so on.
Acquisition:	The student must learn which guard placements, hand positions, feels, etc. signal safety, and which signal danger. Moreover, he must learn what action to take for each signal.
Retention:	The student should be able to perform safely the next time he uses the saw--whenever that may be--not just immediately after instruction.
Recall:	The student must not only retain the information about safe operation, he must also bring it to mind when he needs it.
Generalization:	The student is being trained to saw in a safe manner not just one type of wood but different sizes and types of wood. Moreover, once on the job the student will almost certainly have to work safely with a different type of saw.
Performance:	The proof is in the doing. After all that effort by the instructor and the student, can the latter saw safely?
Feedback:	After a good performance, the student should be complimented for a job well done. If his performance was not exactly right (perhaps he positioned the guard properly but held his hands in a dangerous position), he should be reinforced for the correct parts of his performance and shown how to improve the others.

(NOTE: An analysis in this detail is usually not needed, nor must a separate instructional event always be proved for each step. For example, motivation, apprehension, and acquisition can often be combined, at least in part. Similarly, recall, generalization, and performance can frequently be observed in a single task. Also, learning outcomes are not separate from each other. In learning to saw safely, the student will gain many of the motor skills needed for doing high quality work. Not only can a properly positioned board, pushed at an appropriate speed, be more safely moved through the saw, but the resulting cut is more apt to be smooth and true.)

5. List and briefly describe the motivational functions identified by Erickson.

6. The conditions of learning that Erickson has identified are listed below:

   Active Learner Participation
   Learning Task and Task Set
   Simple-to-Complex
   Motivational Variables
   Reinforcement
   Transfer
   Evaluation

   a. In a sentence or two, describe in your own words how each of the conditions of learning can affect motivation.

   b. Give one example showing how you might take advantage of each learning condition in a way that furthers one of the motivational functions.

   Sample Response:

   Reinforcement can be used to enhance expectancy.

   Example: Ted seemed bright enough, but he never seemed to follow through on anything. His instructor discovered that Ted's family consistently ridiculed his efforts and that he was made to feel like a failure. In short, Ted had so

little experience with success that he had come to expect failure. Having learned this, the instructor praised Ted when he completed small steps successfully. Gradually, Ted came to expect success on small steps; with his courage built up, he was then able to attempt larger steps with the expectation that he could succeed.

Goal 2.3

Content Outline	Activities-Resources

Goal 2.3: Describe the Importance of Each of the Following Categories of Learning Outcomes in Vocational Education: Verbal Information, Intellectual Skills, Cognitive Strategies, Attitudes, and Motor Skills.

The specific competencies to be gained from vocational courses cover a very wide area. Obviously the person studying to be a dental technician will acquire different competencies from the aspiring baker or tool and die maker. Nonetheless, the skills that students can gain from vocational education can be classified into a relatively small number of outcome categories. One such classification was developed by Gagné and is used for this module.*

* See Discussion Question K in Part III.

A. Verbal Information

Evidence that a person possesses verbal information is shown in his ability to state that information, either exactly as he learned it, or as an acceptable paraphrase. Such information is often useful for its own sake; in addition, such information is useful in developing rules and in employing cognitive strategies in problem solving.

B. Intellectual Skills

In displaying verbal information, the student merely repeats (perhaps with rephrasing) some fact or principle that he has learned. To display intellectual skills, the student must show himself

capable of dealing with classes of objects or situations.

Specifically, the student must be able to learn, and to make proper use of the following:

1. Discriminations. A discrimination allows the student to perceive differences among stimuli. This is a prerequisite to concept learning, to acquiring other intellectual skills, and to the intelligent use of motor skills. A person, for example, must be able to discriminate between the cues signifying a properly completed task and those signifying an improperly completed task.
2. Concepts. A "concept," as used by Gagné, allows a person to classify objects into categories on the basis of certain concrete attributes of objects, or relationships among objects. One ascertains if a person has mastered a concept by asking that person for some behavior that requires use of the concept for successful performance. The ability to distinguish good welds from bad welds by classifying them properly is the key criterion of the ability to use the concept of "good weld." The ability to talk knowingly about good and bad welds is irrelevant if the person cannot also classify them properly.
3. Defined Concepts. A defined concept is one that cannot be adequately transmitted merely by display; it also requires an explicit verbal statement. For example, the notion of a "cash crop" requires a verbal definition.

4. Rules. Rules are the symbolic representations of important aspects of the environment that allow a person to deal with a variety of specific situations. Often the very adept person may not be aware of the rules governing his behavior.
   a. Example: Rules specifying the proper way to drive a tractor across uneven ground or up and down hills allow a driver to determine how to negotiate many different types of terrain.
   b. Example: A native speaker of a specific language will generally be unaware of the grammatical rules of that language, yet speak grammatically.
5. Higher-Order Rules. These are rules constructed by the learner from other rules. They are usually constructed when the person is faced with a novel problem.

   Note that, by this definition, what is considered a higher-order rule for one learner may not be for another. For example, many people already know how to alter cooking time as a function of altitude above sea level; for them, selecting an appropriate cooking time reflects the use of a simple rule. Other people do not know this rule, but must figure it out; for them the rule relating cooking time to altitude is a higher-order rule because they must develop it.

C. Cognitive Strategies

Cognitive strategies are the procedures the student uses to guide his behavior in dealing with whatever task is at hand. This may involve methods of coding information, of searching memory, or of solving problems.

The teacher can help the student acquire effective strategies by showing him techniques for applying knowledge to new situations and by providing practice in dealing with problems that require novel applications of knowledge.

D. Attitudes

Attitudes, like all other learning outcomes, are manifested in the behavior of a person. Generally speaking, the effect of an attitude can be seen when a person chooses to follow one of several paths that are clearly available. The emphasis on observable behavior allows one to construct instructional objectives because one describes an attitude in terms of the behaviors expected of a person with that attitude (8), (9).*

(8) Developing Attitude Toward Learning.

(9) Analyzing Performance Problems.

* See Discussion Question L in Part III.

E. Motor Skills

All vocational fields require the student to develop specific motor skills. Usually these skills are best applied in conjunction with appropriate intellectual skills. That is, the student must be able not only to carry out a task, but also to determine what task should be carried out.

F. Study Activities

Based on your reading of the content outline and any additional references as suggested, complete the following activities.

1. Briefly describe what each student is able to do in each category of capability listed below:

   Verbal Information — Cognitive Strategies — Motor Skills
   Intellectual Skills — Attitudes

2. Each of the following performances reflects a class of capability. Indicate the capability of each performance.

   a. Check the safety devices on a piece of equipment before beginning work.

   b. Write down the ingredients needed to prepare an orange sauce.

   c. Develop an experiment to determine the proper amount of fertilizer to use in preparing a particular type of soil for wheat.

   d. Demonstrate how poor canning procedures can lead to the growth of bacteria that cause botulism.

   e. Sort left- and right-hand threaded bolts into separate piles.

   f. Be able to hear the difference between a smoothly running engine and a misfiring engine.

   g. Clean a patient's teeth.

   h. Determine which of several crops is a "cash crop."

   i. Develop a method for predicting eclipses from knowledge of planetary motion and perspective geometry.

3. Activity 2 included examples of each capability. In this activity, you are to show how each capability is important in your area of subject-matter expertise.

   Step 1. Select a motor skill that requires the application of a rule for its successful completion. In a paragraph or two, describe the rule, the motor skill, and the relationship between

the two. (For example, in preparing photographic plates for production of an eight-page signature, the printing student must not only be able to align the original copy properly, adjust the faces, and perform other necessary motor skills, but must also be able to follow the rules specifying which sheets of the original copy are to appear on each plate.)

Step 2. Refer to Figure 3.1 (page 56) in Gagné's book. Notice that rules require concepts, discriminations, and knowledge as prerequisites. For the rule that you described in Step 1, briefly describe a concept, a discrimination, and two or three facts that a person must master as prerequisites to the rule.

Step 3. Refer again to Figure 3.1. Notice that rules are prerequisites for higher-order rules. (For example, a student, having learned the rule for eight-page signatures, might invent a more general, higher-order rule for 16-, 32-, and 64-page signatures, or a higher-order rule for multi-page signature books.) In a paragraph or two, describe a higher-order rule that a student might develop from the rule discussed in Step 1.

Step 4. In performing the motor skill described in Step 1, there are also attitudes that you wish the student to exhibit. These may include concern for safety, attention to quality, and so forth. List and briefly describe the importance of three of these attitudes.

4. Consider each of the examples of capabilities you listed in Activity 3. For each example, describe two or three behaviors that would indicate to you that the student has mastered the performance described. (For example, a student might be observed placing the pages properly for an eight-page signature.)

In practice, of course, a teacher often cannot spend the time to actually observe the behavior. In such cases the teacher may have to rely on evaluations of products, reports, etc. produced by the student. (For example, if the student can show the teacher properly produced eight-page signatures that he himself set up, the teacher does not

have to stand over him and watch him do it to feel sure of the student's competence.) What products could you evaluate to be sure that the student had gained each capability described in Activity 3? If some capabilities demand direct observation of behavior, indicate this and explain why.

Wrapup Activity

Review the answers you gave to the activities for Goal 2.1

Select two tasks from Activities 8 and 9 and write a one- or two-page case study showing specifically how knowledge of learning principles can help accomplish that task.

An outline of such a case study is given below:

Task: Provide a classroom environment that motivates "disadvantaged" students who appear to be unmotivated.

Principles to be applied: Analyze the difficulty in terms of the motivational functions to be performed.

Questions to ask in application: Are the incentives inadequate? Do students lack an expectation that learning will really pay off? Do the students see the direction in which they are to go? Once the problem is identified, which factors of the learning situation should be adjusted and how?

Part III:

Group and Classroom Activities

PART III

GROUP AND CLASSROOM ACTIVITIES

Classroom Activities

1. A Demonstration of How Imagery Can Enhance Recall

   Note to the Instructor: This is an activity designed to illustrate the important point that the inability of a person to recall something with confidence at once does not necessarily mean that he has not retained that something.

   Step 1: Ask students to write the word "left" or "right" to indicate on which side of the front door the doorknob was located in the house where they grew up. Ask them to rate their own confidence in the answer--from 0 for "not confident at all" to 5 for "very confident."

   Step 2: Now have students close their eyes and get a good mental picture of the front of that house. Tell them to approach the house in their mind's eye and reach for the knob. Ask them to write on which side the knob is now located. How do they rate their confidence in this judgment?

   Probable Outcome: Students will feel much more confident after Step 2; some will even change the answer they gave in Step 1. The superior recall thus induced by Step 2 shows that apparent retention can be affected by this recall strategy.

   For Discussion:

   a. Does this exercise suggest that students should be given a variety of cues to help them recall needed information? Elaborate.

b. Are there any memory aids that you teach students in your classes? Elaborate.

c. Can any memory aid techniques suggested by other students be adopted for your classes? Elaborate.

2. Demonstration of the Importance of the Amount of Information Given in Feedback

Note to Instructor: This activity illustrates the point that increasing the amount of information provided by feedback results in more rapid learning.

Equipment Needed:

1. A wastebasket
2. Half a dozen Ping-Pong balls
3. A blindfold
4. A large table
5. A chair

Step 1: Setup

Seat a blindfolded student at the table. Place the wastebasket on the floor beneath the edge of the opposite side of the table. The student is to roll the Ping-Pong ball across the table top so that it falls over the edge and into the wastebasket.

(NOTE: The student must not hear the sound of the basket being placed. Probably the best approach is to lead the student in, already blindfolded, after it has been placed.)

Step 2: Learning With Differing Amounts of Feedback

The student is to continue rolling Ping-Pong balls across the table until he successfully rolls one into the basket. After each roll, the student should be given feedback. One third of the students should be told simply whether or not they were successful; one third should be told whether they missed to the right or to

the left; and the final third should be told by how many feet they missed to the right or to the left. Record the number of rolls required for each student.

Probable Outcome: As the amount of information provided by the feedback increases, fewer rolls should be needed to successfully make a basket.

For Discussion: Describe a skill, piece of information, or concept that you teach (or have taught) in one of your courses.

a. What feedback is given to the student while he is learning this?
b. Does the feedback include an indication of what should be done to improve the performance?
c. How might the feedback be changed to indicate necessary improvements more clearly?

Discussion Questions

A. What basic principles are important to a person working in your area of subject matter expertise? What tasks or problems can a person perform more readily once he has such knowledge?

(Many examples are possible. An electronics instructor might point out how knowledge of the principles of electricity can help him select an adaptor that allows him to use together pieces of equipment that are not otherwise compatible.)

B. Why is each of the major elements in the definition of "learning" crucial?

Observable behavior is the only way that the teacher can determine whether the student is or is not learning.

Persistence is necessary because extraneous factors such as fatigue, drugs, and other physical disabilities affect learning but are not part of it.

Interaction with the environment because maturational changes cannot be included as learning.

C. What kinds of events would some psychologists include as parts of learning theory that probably ought not be so identified?

(Permanent changes that are the result of injury or maturation that are still affected by interaction with the environment.)

D. How does the role of a vocational teacher as a designer and manager of learning and as an evaluator of learning differ from that of a teacher in an academic field?

(Answers to this question will vary from student to student, and many legitimate disagreements may arise. As an example, a vocational teacher might note that he must pay great attention to community needs in planning instruction to conform to the local labor market, whereas academic instructors need not be as concerned with local needs. Such local needs will also help to determine appropriate standards for the evaluation of learning. Similarly, the vocational teacher frequently manages an environment that's more complex than that managed by an academic teacher. Sophisticated tools and equipment must be used in most vocational classes by students who are learning the procedures and strategies of their trade. Thus, the vocational teacher has the important task of managing instruction so that the appropriate relationships are established among capabilities in various domains of learning.)

E. The study activities associated with Goal 2.1 encourage students to identify specific tasks that the teacher or VECS might perform and to show how knowledge of learning principles might help in the performance of each. This application of learning principles should be the basis for a class discussion. In this discussion, point out that learning principles are tools that must be used skillfully by the professional; they are not cure-alls.

F. What other reasons might a VECS or teacher have for studying the details of a learning act?

(Studying the details of a learning act can be important for: learning which steps are apt to be difficult; diagnosing the causes of student difficulties; and designing instruction to help students with difficult steps.)

G. In practice, many steps can often be combined in a single instructional event. Ask students to provide examples.

(Answers will, of course, vary from field to field within vocational education. For example, a test in a television repair course that asks a student to troubleshoot and correct the problem in a malfunctioning set will combine recall, generalization, performance, and feedback as follows: recall of techniques of troubleshooting and of probable diagnosis give particular failings of the television; generalization of techniques and methods of repair to the particular problem at hand; performance of test and repair procedure; and feedback in that the student should be able to see for himself whether or not he has repaired the TV.)

H. During a class discussion of motivation, students should be encouraged to provide specific examples that show the importance of each function and, also, that indicate how the learning conditions mentioned by Erickson can be manipulated to enhance motivation in their areas of subject-matter expertise.

I. Ask students to describe particularly difficult motivational problems that they have encountered. Have class members analyze the problem using Erickson's discussion as a framework for the analysis and suggest solutions in terms of alterations in learning conditions.

(For example, a teacher might report that in dealing with a group of slow learners, he found the students to be very easily discouraged. Upon examining the situation, he found that, because of repeated failures in earlier courses, these students had little expectancy of success and, therefore, even mild setbacks reconfirmed their suspicions that they could not succeed.

Possible solutions include: increasing reinforcement for small successes; a temporary lowering of standards for reinforcement together with shaping proper performance; and heightening incentive by setting the task more clearly and showing the benefit of completing the task in a way that heightens its appeal to the students.)

J. What is the relationship between Gagné's steps and Erickson's motivation for learning?

(Sample answer: Gagné analyzes a learning act to ascertain what steps are taken when something is learned; establishing motivation is the all-important first step. Erickson discusses how instruction can be planned and managed to establish and maintain high levels of motivation. A highly motivated student will be more readily able to take all the steps in an act of learning.)

K. The study activities ask the student to provide examples of each of his own field's capabilities and the behavior which indicates that someone possesses each capability. Students should be encouraged to share their examples during the class discussion of capabilities.

L. Discuss the point that <u>attitudes</u> can be determined by observing behavior.

(As a starting point, ask students to convey particular complaints about attitude that have come from teachers, employers, or supervisors, and specify the <u>behaviors</u> that gave rise to the complaints. For example, a supervisor complained that an employee had a disrespectful attitude. Upon examination, it turned out that the employee did not turn and face the supervisor when the latter gave instructions, but avoided the supervisor's gaze. The supervisor took this as signifying disrespect, although the employee did not intend to be disrespectful.

On the positive end, attitude of "safety consciousness" may be shown by an employee who always wears goggles and other safety equipment when using machinery and who checks all guards and other safety devices on the machines before beginning work.)

Part IV:

Student Self-Check

PART IV
STUDENT SELF-CHECK

GOAL 2.1

1. Write a brief essay (one or two pages) describing why a VECS should understand learning principles. Include examples that show how understanding such principles will help him on the job. Also include a discussion of the limitations of learning principles in helping the VECS overcome problems. (2.11)

2. Define "learning" in a way that is consistent with Gagné's definition. (2.12)

3.a. What is the central purpose of any educational program? (2.12)

   b. What is the primary task of the teacher?

   c. What is the justification for selecting classroom learning activities?

   d. How does knowledge of the psychology of learning relate to the primary role of the teacher?

4. What are the three primary functions of a teacher in promoting learning? (2.13, 2.14)

5. Distinguish between the role a VECS might play in performing each learning function and that which a teacher might play. (2.13, 2.14)

6. Describe in a sentence or two one task that you would perform if teaching in your subject-matter area. In another sentence or two, describe how knowledge of learning principles might help you perform this task. (2.13)

7. Describe in a sentence or two one task that a VECS might perform in completing each learning function. In another sentence or two, describe how knowledge of learning principles might help in the performance of this task. (2.14)

GOAL 2.2

8. List in order the phases of an act of learning as specified by Gagné. (2.21)

9. The processes identified by Gagné are listed below. Write the name of the phase associated with each process. (2.22)

Process
Coding; storage entry
Retrieval
Expectancy
Responding
Transfer
Reinforcement
Attention; selective perception
Memory storage

10. In a sentence or two, describe a motor skill, an attitude, and a bit of knowledge that you want students to learn in a class that you might teach. Indicate briefly the instructional arrangements you might establish to help a student at each step. (2.23)

11. List and briefly describe the motivational functions identified by Erickson. (2.24)

12. List four conditions of learning that Erickson identified as affecting motivation. Briefly describe how each has its effect. (2.24)

GOAL 2.3

13. Describe what a student is able to do in each category of capability identified by Gagné. (2.31)

    a. Verbal Information
    b. Intellectual Skills
    c. Cognitive Strategies
    d. Attitude
    e. Motor Skills

14. List two performances that require each of the following capabilities listed below for their successful completion; offer a one-sentence explanation as to why the performance requires that capability. (2.32)

    a. Verbal Information
    b. Intellectual Skill
    c. Cognitive Strategy
    d. Attitude
    e. Motor Skills

15. Select one performance from each capability mentioned in your response to Question 14. Describe a behavior that would convince you a student possessed that capability. (2.33)

Part V:

Appendices

PART V

APPENDICES

Appendix A:

Possible Study Activity Responses

GOAL 2.1

1. (Sample responses are given below. You may have come up with others that are equally good or better. Be prepared to discuss them with others in your class, or with your instructor.

   Task 1: Knowing how to determine what is motivating for an individual will help the curriculum specialist assess the individual's motivational needs and then help him plan to meet them.

   Task 2: Explain in terms of the improved learning that is expected why a new approach is being introduced.

   Task 3: Help teachers distinguish genuine differences between needs and student whims.

   Task 4: Explain why more money is needed to sustain acceptable learning standards or to update a program (for example, why changing the skills used with the obsolete equipment in schools to skills used with the modern equipment of industry is very difficult--if, in fact, it is).

   Task 5: Specify the minimum equipment needed to reach objectives, and indicate how information can best be presented to help students reach these objectives.)

2. (Possible responses are given below. Yours need not match them. Be prepared to discuss your responses with others in your class, or with the instructor.

   Union president: Show that the type of training provided by the school will prepare students to enter the apprenticeship program.

   School Board member: Defend the purchase of needed equipment in terms of the learning improvements expected.

Parent of student: Explain how a new instructional technique (such as individualized instruction) can help his child learn more effectively.

Educational psychologist: Be able to benefit from contact with this person by "speaking his language."

Academic teacher: Explain why the learning process in a vocational course may require longer blocks of time than the traditional class period.

Counselor: Help the counselor determine the appropriate placement for a transfer student by assessing the competencies possessed by that student.

Student: Help the student overcome difficulties he is experiencing in class.)

3. Learning is an internal organic process that involves interaction with the external environment and is inferred when a persistent change in behavior can be observed (5).

4. (The specific response to this activity depends on the particular subject area you selected.)

5. There is only one legitimate reason for asking (or requiring) a person to attend school: he will learn something. Therefore, any aspect of the educational setting that does not in some way further this end is out of place.

6. (The specific response to this activity depends on the particular subject area you selected.)

7. (The specific response to this activity depends on the particular subject area you selected.)

8. (The specific response to this activity depends on the particular tasks you selected. Be prepared to discuss your responses and those given by others. Discussion should focus on tasks, problems, and on solutions to problems by the use of learning principles. Instructional design, management, and evaluation all overlap to a degree; arguments regarding classification of one task or another should be avoided as they are more likely to be pedantic than useful.)

9. (The specific response to this activity depends on the particular VECS job and tasks you selected. Be prepared to discuss your response in class.)

Learning Task and Task Set - By clearly indicating the goals and the tasks required to reach those goals, the reason for engaging in learning activities will become clearer to the student as will the benefits to be obtained.

Simple-to-Complex - By assuring frequent success (particularly early successes), the student comes to expect success and its attendant rewards.

Motivational Variables - (This category includes a variety of factors pertaining to the establishment of learning conditions that will lead to reinforcement. These conditions are, by and large, similar to the other six categories discussed.)

Reinforcement - By confirming expectancies, reinforcement signals the student that the overall goal (or subgoal) has been reached. This makes it easier to establish the expectancy of success for subsequent learning.

Transfer - By discovering (often with the judicious aid of the teacher) that new knowledge can be applied in a variety of settings, the student will be able to gain even more reinforcement from the successful solution of new problems.

Evaluation - By showing the student how much progress has been made and how much closer he is to the ultimate goal, evaluation performs reinforcing functions and serves to increase expectancy and incentive.

b. (The specific response to this activity depends on the particular examples you provide. Your examples should clearly show how one can take advantage of each condition to enhance motivation. Share your examples with others in the class.)

GOAL 2.3

1. (The following are sample responses only; your responses need not match them exactly. Also feel free to consult Chapter 3 in Gagné to check your responses.)

Verbal Information - to know information as transmitted and be able to repeat it either verbatim or in one's own words

Intellectual Skills - to be able to perform necessary intellectual processes with information presented; this may include making discriminations, applying rules, or classifying on the basis of concepts.

Cognitive Strategies - to be able to guide one's own thinking, learning, or recall attempts (hopefully in an effective fashion)

GOAL 2.2

1. a. motivation
   b. apprehending
   c. acquisition
   d. retention
   e. recall
   f. generalization
   g. performance
   h. feedback

2.

	Phase	Process
a.	feedback	reinforcement
b.	recall	retrieval
c.	retention	memory storage
d.	apprehending	attention; selective perception
e.	performance	responding
f.	acquisition	coding; storage entry
g.	motivation	expectancy
h.	generalization	transfer

3. and 4. (The specific response to these activities depends on the particular attitudes, skills, or knowledge bases you identified.)

5. (The answers given below are suggestions only. Check your responses against Erickson's article as well as against these suggested answers.

   Arousal Function - to get the student to attend to instruction and to respond as directed

   Expectancy Function - to clarify the end result of instruction for the student and convince the student that the end result can, in fact, be achieved

   Incentive Function - to point out to the student the benefits that will result from reaching the goal

   Direction-of-Learning Function - to wean the student from over-reliance on the teacher by helping him to see the benefits of increased autonomy.)

6. a. (The following are sample responses only. Compare your responses with those of other class members.)

   Active Learner Participation - By increasing the effectiveness of learning, active participation leads to more reward, hence increasing motivation (primarily through greater expectancy of success).

Attitudes - to choose among possible actions on the basis of internalized values

Motor Skills - to be able to perform the physical acts necessary to complete a task

2. a. Attitude
   b. Verbal Information
   c. Cognitive Strategy
   d. Rule
   e. Concrete Concept
   f. Discrimination
   g. Motor Skill
   h. Defined Concept
   i. Higher-Order Rule

3. (The specific response to this activity depends on your particular area of subject-matter expertise. Be prepared to discuss your answers with others in the class and with your instructor.)

4. (The specific response to this activity depends on your particular area of subject-matter expertise and the responses you provided for Activity 3. Be prepared to discuss your responses with others in the class and with your instructor.)

Appendix B:
Possible Self-Check Responses

(NOTE: Suggested answers are provided below. Student answers need not conform exactly to these--alternate but equally acceptable answers can be given. Some of the items call for examples. In such cases, the characteristics of an acceptable example are briefly described.)

GO/L 2.1

1. Write a brief essay (one or two pages) describing why a VECS should understand learning principles. Include examples that show how understanding such principles will help him on the job. Also include a discussion of the limitations of learning principles in helping the VECS overcome problems. (2.11)

   (Many valid points can be made with respect to the role of the VECS as a designer and manager of instruction, and as an evaluator of learning. Points that may be made include:

   (1) Learning principles are basic to education; a person should understand the principles that underlie his trade or profession.

   (2) Planning instruction requires the VECS to understand the steps involved in a learning act and how these steps can be supported to reach various learning outcomes if he is to plan instructional events most efficiently.

   (3) Similarly, managing and adjusting instruction to the needs of the individual student and determining the nature of learning difficulties will be facilitated if the VECS understands various ways of supporting learning steps.

   (4) In evaluating learning the VECS will be able to provide more effective feedback to the student if he knows the steps in learning and can design tests that help to show clearly where a student falls short.

   Learning principles, while useful, cannot substitute for the professional competence and judgment of the VECS and instructor; this is their basic limitation. Learning principles are tools that must be used skillfully; they are not infallible writ and will not supply all answers.)

2. Define "learning" in a way that is consistent with Gagné's definition. (2.12)

(The important points are that learning is:

a. an internal organic process

b. that occurs as a result of interaction with the external environment

c. and is inferred from persistent change in observed behavior.)

3.a. What is the central purpose of any educational program? (2.12)

To promote learning by the student

b. What is the primary task of the teacher?

To arrange conditions so that learning can take place

c. What is the justification for selecting classroom learning activities?

These activities, whether conducted by the instructor or by the student, should lead to learning by the student.

d. How does knowledge of the psychology of learning relate to the primary role of the teacher?

Such knowledge can provide valuable help in the arrangement of conditions that enhance learning.

4. What are the three primary functions of a teacher in promoting learning? (2.13, 2.14)

a. designer of instruction

b. manager of instruction

c. evaluator of learning

5. Distinguish between the role a VECS might play in performing each learning function and that which a teacher might play. (2.13, 2.14)

   (Many answers are possible. In general, the discussion should focus on the "distance" from the classroom of the person performing the function. For example, the teacher must be concerned with very specific situations; on the other hand, the VECS must usually be concerned with more general applications. The VECS will capitalize on his special expertise in designing curricula and on analyzing the learning situation in general. The teacher will be more concerned with the specific demands of a class, a student, or the subject matter.)

6. Describe in a sentence or two one task that you would perform if teaching in your subject-matter area. In another sentence or two, describe how knowledge of learning principles might help you perform this task. (2.13)

   (The student examples should clearly describe a <u>task</u> and the way knowledge of learning principles can facilitate its completion. For example, in developing an examination, a teacher of shop math may need to determine if students can convert from English to metric length units. He will want to select problems that test this ability but that do not require additional knowledge that some students may have but others not.)

7. Describe in a sentence or two one task that a VECS might perform in completing each learning function. In another sentence or two, describe how knowledge of learning principles might help in the performance of this task. (2.14)

   (The student examples should have the same characteristics as those given for the teacher, but should be for tasks that a VECS is more apt to perform. For example, a VECS might develop a procedure that allows students from all fields at a Regional Occupational Center to have access to remedial mathematics modules that meet the specific needs of the student.)

GOAL 2.2

8. List in order the phases of an act of learning as specified by Gagné. (2.21)

   a. Motivation Phase
   b. Apprehending Phase
   c. Acquisition Phase
   d. Retention Phase
   e. Recall Phase
   f. Generalization Phase
   g. Performance Phase
   h. Feedback Phase

9. The processes identified by Gagné are listed in the right-hand column. Write the name of the phase associated with each process in the space to the left. (2.22)

Phase	Process
Acquisition	Coding; storage entry
Recall	Retrieval
Motivation	Expectancy
Performance	Responding
Generalization	Transfer
Feedback	Reinforcement
Apprehending	Attention; selective perception
Retention	Memory storage

10. In a sentence or two, describe a motor skill, an attitude, and a bit of knowledge that you want students to learn in a class that you might teach. (2.23)

Motor Skill Example: Properly gap spark plug.

Attitude Example: Cooperate willingly in conducting joint projects with other students in the shop.

Knowledge Example: Know that black carbon deposits on the tip of a spark plug signifies that the fuel is not being completely burnt.

In the table below, indicate briefly the instructional arrangements you might establish to help a student at each step.

Step	Motor Skill	Attitude	Knowledge
Motivation	Explain importance of proper gapping.		
Apprehending	Show examples of proper, too light, and too loose fits of a gap gauge.		

11. List and briefly describe the motivational functions identified by Erickson. (2.24)

Arousal Function - to get the student to attend to instruction and to respond as directed

Expectancy Function - to clarify the end result of instruction for the student and to convince him that the end result can, in fact, be achieved

Incentive Function - to point out to the student the benefits that will result from reaching the goal

Direction-of-Learning Function - to wean the student from over-reliance on the teacher by helping him to see the benefits of increased autonomy

12. List four conditions of learning that Erickson identifies as affecting motivation. Briefly describe how each has its effect. (2.24)

Active Learner Participation - By increasing the effectiveness of learning, active participation leads to more reward, hence increasing motivation (primarily through greater expectancy of success).

Learning Task and Task Set - By clearly indicating the goals and the tasks required to reach those goals, the reason for engaging in learning activities will become clearer to the student as will the benefits to be obtained.

Simple-to-Complex - By assuring frequent success (particularly early successes), the student comes to expect success and its attendant rewards.

Motivational Variables - (As noted in the Instructor Lesson Plan, this category includes a variety of factors pertaining to the establishment of learning conditions that lead to reinforcement. These conditions are, by and large, the same as the other six categories discussed.)

Reinforcement - By confirming expectancies, reinforcement signals the student that the overall goal (or subgoal) has been reached. This makes it easier to establish the expectancy of success for subsequent learning.

Transfer - By discovering (often with the judicious aid of the teacher) that new knowledge can be applied in a variety of settings, the student will be able to gain even more reinforcement from the successful solution of new problems.

Evaluation - By showing the student how much progress has been made and how much closer he is to the ultimate goal, evaluation performs reinforcing functions and serves to increase expectancy and incentive.

(NOTE: Each of the preceding summaries looks to the positive side, that is, to cases in which the particular condition was well-handled. Each condition can also be poorly handled. For example, evaluation can be so poorly handled that anything less than perfection is presented to the student as a great failure.)

GOAL 2.3

13. Describe what a student is able to do in each category of capability identified by Gagné. (2.31)

    a. Verbal Information - to know information as transmitted and be able to repeat it either verbatim or in one's own words

    b. Intellectual Skills - to be able to perform necessary intellectual processes with the information available; this may include making discriminations, applying rules, or classifying on the basis of concepts.

c. Cognitive Strategies - to be able to guide one's own thinking, learning, or recall attempts (hopefully in an effective fashion)

d. Attitude - to choose among possible actions on the basis of internalized values

e. Motor Skills - to be able to perform the physical acts necessary to complete a task

14. List two performances that require each of the following capabilities listed below for their successful completion; offer a one sentence explanation as to why the performance requires that capability.

a. Verbal Information

(1) Sample: A dental hygienist instructs students in tooth care; this requires him to possess the verbal information that he is to transmit.

(2)

b. Intellectual Skill

(1) Sample: A printer must select the proper typeface to match the customer's specifications; this requires that he be able to discriminate among fonts.

(2)

c. Cognitive Strategy

(1) Sample: A distributive education major must figure out a way to cut down shoplifting at a store where he is receiving on-the-job training; this requires the use of a cognitive strategy to recall antishoplifting techniques that are particularly useful and adapt them to this store and/or to devise new techniques.

(2)

d. Attitude

(1) Sample: A student in a home economics course must continually stir a delicate sauce to keep it from burning, and adjust the heat of the stove to assure the right consistency; this requires a diligent, careful attitude by the student who chooses to pay careful attention to cooking and does not engage in other distracting activities.

(2)

e. Motor Skills

(1) Sample: A welding student must be able to make a weld capable of withstanding severe stresses; this performance requires considerable motor skills.

(2)

15. Select one performance from each capability mentioned in your response to Question 14. Describe a behavior that would convince you a student possessed that capability. (2.33)

(The student examples should be behavioral examples that give evidence of the capability, not capability descriptions that omit a behavioral reference.

For example: "The student will know the difference between serif and sans-serif fonts" is not an adequate example of the intellectual skill discrimination since it gives no indication of the behavior to be observed.

"The student will, given ten serif and ten sans-serif faces, correctly sort them into piles with the serifs in one pile and the sans-serifs in another" is adequate.)

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